

CLAIMS

1. An air bag assembly for use in a vehicle for impact restraint, the air bag assembly comprising:

an air bag cushion inflatable to first and second amounts of expansion and  
5 deployable in an interior space of the vehicle, wherein said second amount of expansion  
is greater than said first amount of expansion;

at least one tether having a first portion;

10 wherein said first portion includes a first loop, wherein said first loop is  
supported at a first location at the cushion; and

wherein said at least one tether is releasably restrained such that the  
cushion is inflatable to the first amount of expansion when said at least one tether is so  
15 restrained and the cushion is inflatable to the second amount of expansion after said at  
least one tether is released.

2. The air bag assembly of claim 1, wherein said at least one tether  
has a second portion;

wherein said second portion is supported at a second location substantially  
5 opposing said first location; and

wherein said at least one tether is releasably restrained between said first  
and second portions.

3. The air bag assembly of claim 2, wherein said second location is at  
the cushion.

4. The air bag assembly of claim 2, further comprising:

support structure;

5 wherein the cushion is secured at said support structure; and

wherein said second location is at said support structure.

5. The air bag assembly of claim 1, further comprising:

at least one support element at said first location;

5 wherein said first loop is secured at said at least one support element.

6. The air bag assembly of claim 5, wherein said at least one tether has a longitudinal portion extending from said first loop, and wherein said at least one tether is characterized by an absence of sliding along the longitudinal portion at said first location after said at least one tether is released.

7. The air bag assembly of claim 5, wherein said at least one support element is at least one tubular slot formed in the cushion.

8. The air bag assembly of claim 7, wherein the first loop is secured to the tubular slot.

9. The air bag assembly of claim 7, further comprising at least one panel secured to said at least one tubular slot and disposed between said at least one tubular slot and said first loop.

10. The air bag assembly of claim 5, wherein said at least one support element is a panel, and wherein the panel is secured to the cushion by sewn seams spaced apart from one another.

11. The air bag assembly of claim 5, further comprising:

at least one reinforcement element secured to one of said at least one support element and said first loop at said first location.

12. The air bag assembly of claim 1, further comprising :

at least one lateral tether element supported at opposing lateral locations at the cushion, wherein said opposing lateral locations are substantially laterally disposed  
5 with respect to said first portion.

13. The air bag assembly of claim 12, wherein said at least one lateral tether element is integral with said at least one tether.

14. The air bag assembly of claim 13, wherein said at least one tether and said at least one lateral tether element are unitary.

15. The air bag assembly of claim 12, wherein said at least one lateral tether element is formed with an opening and wherein said at least one tether routes through said opening.

16. The air bag assembly of claim 1, wherein the cushion is formed with openings and said at least one tether routes through said openings.

17. The air bag assembly of claim 1, further comprising:

a tether release mechanism for releasably restraining said at least one tether.

18. The air bag assembly of claim 17, further comprising:

an inflator activatable to discharge inflation gas upon the occurrence of predetermined vehicle conditions;

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wherein the cushion is in fluid communication with the inflator such that upon discharge of inflation gas from the inflator, the cushion is inflated;

an actuation mechanism activatable based upon measurements from one or  
10 more sensors measuring conditions of an occupant during activation of the inflator to release said at least one tether upon occurrence of predetermined occupant conditions;  
and

an actuatable variable inflation device to control the amount of inflation  
15 gas discharged into the air bag cushion and wherein the actuatable variable inflation device comprises a moveable member alignable with a vent opening within a housing in which the inflator is disposed, the moveable member being moveable relative to the vent opening upon activation of the actuation mechanism thereby adjusting the effective venting area of the vent opening during deployment of the cushion.

19. The air bag assembly of claim 1, wherein said at least one tether includes a second loop; and

wherein said at least one tether is releasably restrained at said second loop.

20. The air bag assembly of claim 19, wherein said second loop is formed from said at least one tether.

21. The air bag assembly of claim 19, further comprising:

a third loop connected to said second loop;

5 wherein said at least one tether is releasably restrained at said third loop.

22. An air bag assembly for use in a vehicle for impact restraint, the air bag assembly comprising:

an air bag cushion inflatable to first and second amounts of expansion and  
5 deployable in an interior space of the vehicle, wherein said second amount of expansion is greater than said first amount of expansion;

10 at least one tether having a first portion and a second portion, wherein the first portion is formed into a first loop, wherein said first loop is supported at a first location at the cushion, and wherein the second portion is supported at a second location substantially opposing said first location;

15 at least one lateral tether element supported at opposing points of attachment at the cushion, wherein said opposing points are substantially laterally disposed with respect to said first portion;

wherein said at least one tether includes a second loop disposed between said first and second portion; and

20 wherein said at least one tether is releasably restrained at said second loop such that the cushion is inflatable to the first amount of expansion when said at least one tether is restrained and the cushion is inflatable to the second amount of expansion after said at least one tether is released.

23. The air bag assembly of claim 22, wherein said at least one lateral tether element is integral with said at least one tether.

24. The air bag assembly of claim 22, wherein said at least one tether and said at least one lateral tether element are unitary.

25. An air bag assembly for use in a vehicle for impact restraint, the air bag assembly comprising:

an air bag cushion inflatable to first and second amounts of expansion and  
5 deployable in an interior space of a vehicle, wherein said second amount of expansion is greater than said first amount of expansion and having at least one tubular slot formed in the cushion;

10 at least one tether having a first portion, wherein said first portion is formed into a first loop, wherein said first loop is routed through said at least one tubular slot such that the tether is supported at the tubular slot;

15 at least one lateral tether element supported at opposing points of attachment at the cushion, wherein said opposing points are substantially laterally disposed with respect to said first portion; and

wherein said at least one tether is releasably restrained such that the cushion is inflatable to the first amount of expansion when said at least one tether is

20 restrained and the cushion is inflatable to the second amount of expansion after said at  
least one tether is released.

26. The air bag assembly of claim 25, wherein said at least one lateral  
tether element is integral with said at least one tether.

27. The air bag assembly of claim 25, wherein said at least one lateral  
tether element and said at least one tether are unitary.